

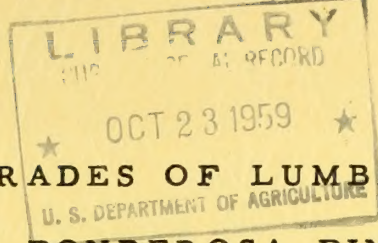
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AMOUNT AND GRADES OF LUMBER FROM
BLACK HILLS PONDEROSA PINE LOGS

by

E. F. Landt and R. O. Woodfin, Jr.



ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

Raymond Price, Director

Fort Collins, Colorado

FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE

C R E D I T S

This study was conducted in cooperation with:

Buckingham Wood Products Co., Inc.
Rapid City, South Dakota

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Custer, South Dakota

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E. F. Landt and R. O. Woodfin, Jr., Technologists

U.S.D.A., NAL

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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION
FOREST SERVICE U. S. DEPARTMENT OF AGRICULTURE

Central headquarters maintained in cooperation with Colorado State University at Fort Collins; research reported here was conducted in cooperation with the South Dakota School of Mines and Technology at Rapid City.

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- - -

INTRODUCTION

Lumbering has been the major wood-using industry in the Black Hills since settlement in 1876. Practically all lumber cut during this early period came from ponderosa pine and was used locally. To meet the demand caused by growth of cities in the early 1900's, additional lumber had to be shipped in from the Northwest. Later, this caused strong competition with local lumber. In turn, some of the lumber manufactured in the Black Hills area now goes to outside markets, where it also meets keen competition.

Lumbering still is the major wood-using industry in the Black Hills and makes up an important part of the local economy. To keep local pine competitive with that of other areas and with other materials and thereby more completely utilize the sawtimber resource, more specific information is needed on the amount and grade of lumber recovered from sawtimber that is currently available. Such information is required by loggers, sawmill operators, lumber remanufacturers, timber growers, and forest administrators. To supply part of this information, and to make it as representative as possible, this study was made in 1957 at four sawmills in the area.

The Western Pine Association furnished a lumber inspector and a log scaler and grader. The Black Hills National Forest furnished men when needed to collect mill data. The sawmills adjusted their operation to permit log scaling and lumber grading.

METHODS

MILL SELECTION

Five types of sawmills are operating in the Black Hills. Forty-three of the 50 mills have conventional circular head rigs; 2 have circular head rigs in combination with horizontal band resaws; 3 have circular head rigs in combination with sash cant gangsaws; 1 has a circular head rig and a circular resaw; and 1 has a band head rig in combination with a horizontal band resaw.

Four of these mill types were sampled. The mill with a band head rig and horizontal band resaw was not sampled because only about half of its annual production goes into lumber.

LOG SCALING AND DIAGRAMING

At three sawmills the study logs were selected as they were brought in from the woods and then scaled, graded, and diagrammed several weeks before sawing. At the fourth mill about every third log was selected as the logs were brought in the yard; then the logs were scaled, graded, and diagrammed at the time of sawing. With the exception of this mill, yarding operations were adjusted so that all logs going through the mills were study logs.

Log scaling and grading was done by Rocky Mountain Forest and Range Experiment Station (RM) personnel using the 1956 revision of the National Forest Scaling Handbook (Scribner Decimal C log rule) and U. S. Forest Service Region 6 ponderosa pine log grades as described November 1, 1938. At the time of sawing, all study logs were scaled and graded by a Western Pine Association (WPA) log scaler and grader using the same log rule and log grading specifications.

Log diagramming was done by RM personnel. Because diagramming was done in advance of sawing, adequate time was available for examining each log. Diagramming was according to a system adopted from the Forest Products Laboratory.^{2/} Each log was also numbered so that the boards cut from it could be identified.

^{2/} U. S. Forest Service. Saw-log grades for hardwoods - - Central States studies. Forest Prod. Lab. Rpt. D1699, 22 pp., illus. November 1947.

MILL PROCEDURES

After the logs were regraded and scaled on the deck by the WPA scaler, they were sawn according to regular commercial practice. The lumber from each log was marked with the log number and was graded green according to WPA standards by a WPA lumber inspector. Each board was tallied by lumber grade, thickness, width, length, and log number. The same inspector regraded all lumber sawn by the circular and horizontal band resaw sawmill after the boards were kiln dried and surfaced. Again all lumber was tallied by grade, thickness, width, length, and log number. The lumber was dried in one charge to a moisture content of about 11 percent. All sawn material was graded as lumber. Sawing time (time log was on head rig carriage) was recorded for each log.

ANALYSIS

Coded log and board characteristics were punched on IBM cards. Two IBM cards were required for each log and one card was used for each board. Log characteristics were recorded on these cards from log diagram field sheets. The dimensions and grade of each board were recorded from mill tally sheets. Board values punched on cards were based on the average October 1957 selling prices, less broker and commission fees, of three Black Hills sawmills.

The logs were segregated into two classes - - sound and defective (logs containing deductible defect).

Green lumber tally volumes from three sawmills were converted to dry surfaced volumes by using the percent of change between green and kiln-dry lumber volumes obtained on lumber sawn at the fourth mill.

RESULTS

A total of 1,840 logs were used in the study. These logs were 8 to 16 feet long and 5 to 25 inches in diameter. The average log diameter, small end inside bark (d.i.b.), was 11.1 inches; however, 9-inch diameter logs were most frequent (fig. 1). About 73 percent of the log scale volume came from 16-foot logs. Forty-two percent of all logs were classified as defective by both WPA and RM scalers.

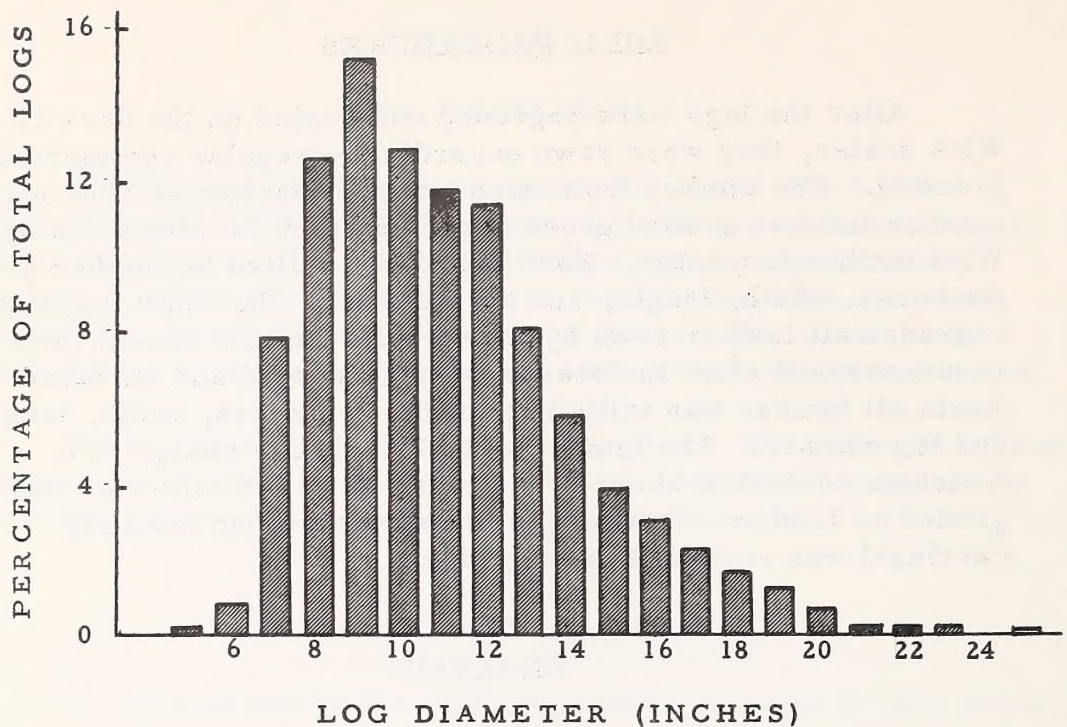


Figure 1. --Distribution of log diameters-- 1,840 logs.

The average net scale (RM scaling) was 59 board-feet per log, and the average converted dry lumber tally was 77 board-feet. The 1,840 logs cut out 140,888 board-feet of dry lumber. Ninety-six percent of this volume was in 4/4 lumber and the remainder was 5/4, 6/4, and 7/4.

SCALING DEFECT

RM scaling values in table 1 show that about 41 percent of the total net scale came from recognized defective logs, and 59 percent came from logs scaled as sound. WPA scale values placed about 43 percent of the volume from recognized defective logs. About 65 percent of the defective logs contained 11 to 40 percent cull (fig. 2). Western red rot (heart rot) was the greatest cause of defect. The remainder of the recognized defective logs contained sweep, crook, shake, fire scar, and sap rot. An additional 266 logs that were scaled as sound, contained heart rot that was not visible until the logs were sawn. When these logs were included along with those having recognized defect, then 58 percent of the net log scale came from logs having some kind of defect.

Table 1.--Lumber recovery data from logs sawn at four sawmills

Type and number of logs	Scaling by	Average d. i. b. (small end)	Scribner scale				Dry lumber tally		Over- run	Value		
			Average per log Net	All mills			Average per log	All mills		Per log	Per M b. f. 1/	
				Gross	Net							
			Inches	Board- feet	Board- feet	Board- feet	Per- cent	Board- feet	Board- feet	Per- cent	Dollars	Dollars
Sound 1,067	RM ^{2/}	10.5	61	64,590	64,590	59.2	72	77,155	19.4	5.63	77.85	
	WPA ^{3/}	10.7	59	63,140	63,140	57.1	69	73,479	16.4	5.47	79.13	
Defective 773	RM	11.9	58	63,820	44,550	40.8	82	63,733	43.1	5.95	72.22	
	WPA	11.9	61	67,950	47,430	42.9	87	67,409	42.1	6.17	70.65	
Total 1,840	RM	11.1	59	128,410	109,140	100.0	77	140,888	29.0	5.77	75.33	
	WPA	11.2	60	131,090	110,570	100.0	77	140,888	27.4	5.77	75.33	

1/ M b.f. = 1,000 board feet dry surface lumber tally.

2/ Rocky Mountain Forest and Range Experiment Station scaling.

3/ Western Pine Association scaling.

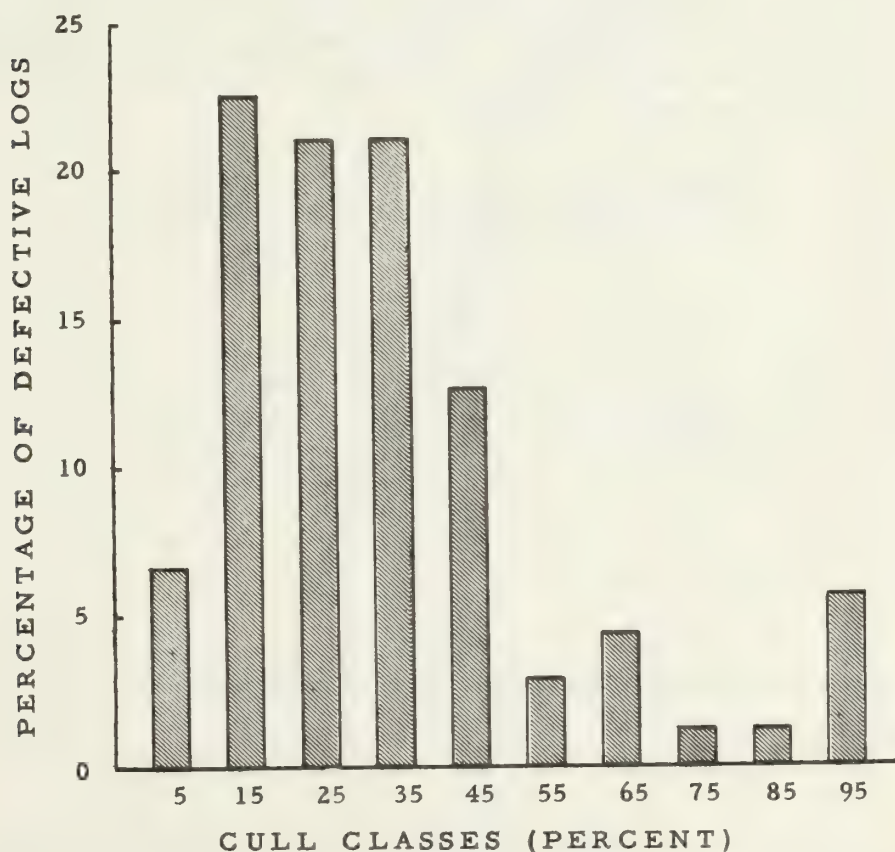


Figure 2. --Distribution of logs having deductible defect by cull classes (RM scaling), Black Hills ponderosa pine.

OVERRUN

The average overrun for the four mills (table 1), when based on 109,140 board feet (RM net log scale), was 29 percent and 27 percent when based on 110,570 board feet (WPA net log scale). Tables 6 to 11, Appendix, give overrun by log grade and diameter for sound 16-foot logs. Overrun ranged from 18 to 41 percent for the four mills. Generally, sound logs produced about 19 percent overrun and defective logs produced about 43 percent overrun (RM scaling).

SEASONING DEGRADE

Changes in lumber grades, as well as in total lumber volume, due to kiln drying and surfacing are shown in table 2. This conversion from green lumber to dry surfaced lumber is based upon 68,077 board feet sawn from 716 logs. The total loss in lumber volume from green to dry was 2.6 percent for all logs, 2.2 percent for sound logs, and 3.2 percent for defective logs. Defective logs were not separated by percentage of cull in this analysis. These conversion factors were used on the green graded lumber.

Table 2.--Percentage change in volume for different lumber grades
from green to dry surfaced lumber--716 logs

Type of logs	Lumber grades									Total
	Select		Mould- ing	#1 shop & #3 clear	Common					
	C & Btr.	D		1&2	3	4	5			
	----- Percent -----									
Sound	-70.6	- 1.9	+4.7	-18.7	-28.3	-1.2	+29.6	+ 7.3	-2.2	
Defective	-41.5	-23.4	+6.7	-10.1	-15.0	-1.2	+ 8.3	-16.5	-3.2	
All	-55.0	-16.2	+5.9	-14.3	-24.3	-1.2	+16.9	-10.0	-2.6	

LUMBER RECOVERED BY LOG DIAMETERS

The relation of lumber tally to log diameter for all sound 16-foot logs can be expressed by the regression equation $Y = 2.0195 X - 0.1910$ where Y is the logarithm of lumber tally and X is the logarithm of log diameter, small end inside bark (fig. 3). The average lumber recovered (computed from similar regressions) by log diameters from sound and

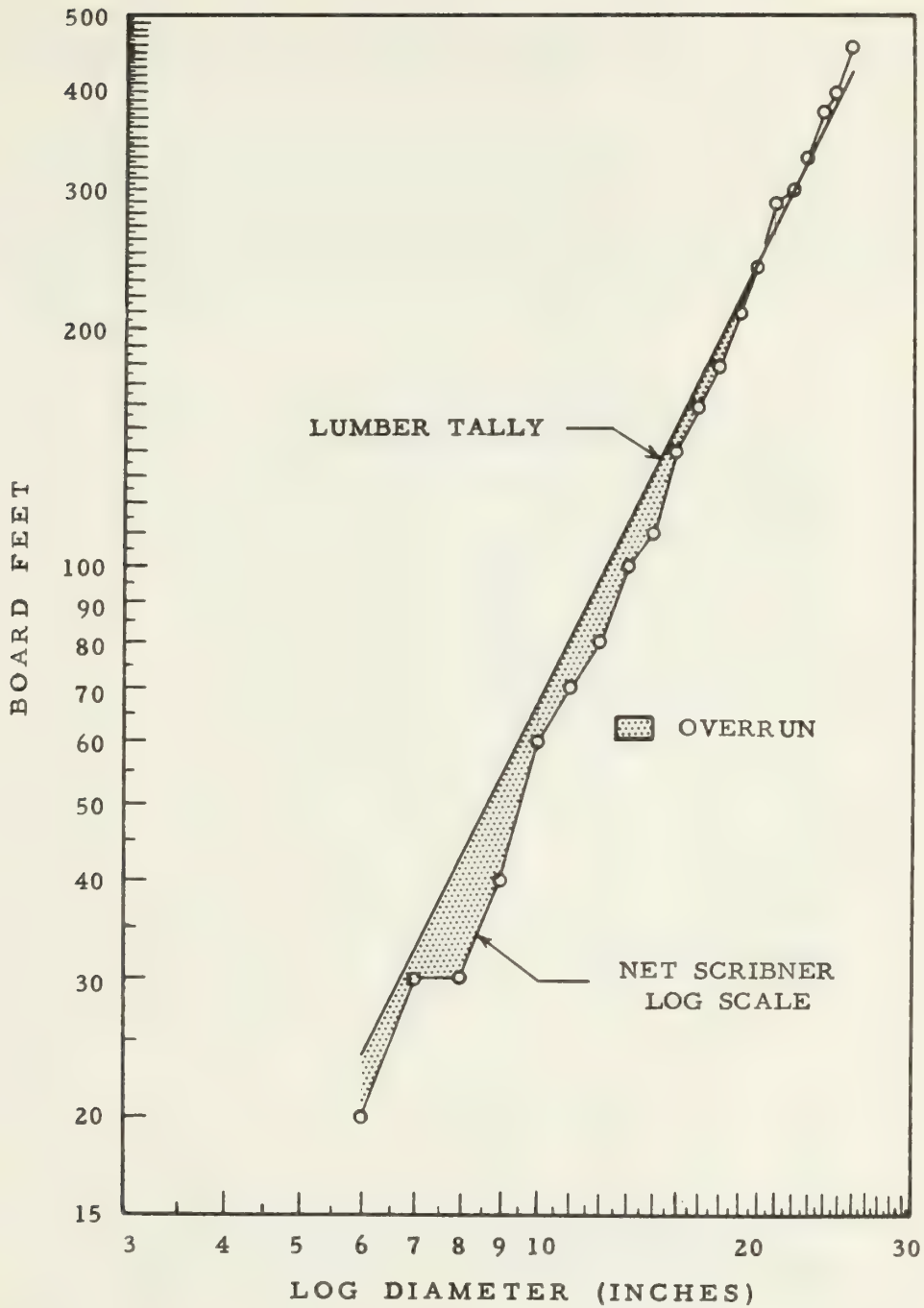


Figure 3. --Relation of lumber tally and net scale to log diameter and overrun for all sound 16-foot logs (RM scaling).

defective 16-foot logs for the six log grades is shown in tables 6 through 11, Appendix. Defective logs cut out less lumber than did sound logs of the same diameter. The difference varied with the amount of defect. The relation of lumber recovered by percentage cull classes was not established in this analysis.

Although 85 percent of the logs were in the 7- to 14-inch diameter class, about 77 percent of the lumber was cut into 6- and 8-inch boards and only 7 percent into 4-inch boards. The remainder was cut into 10-, 12-, and a few 14-inch wide boards (table 3).

Table 3.--Percentage green lumber recovered in board widths by log diameters for combined mills, by inch diameter classes

Log diameter (small end): d. i. b.	Logs	Board width in inches					
		4	6	8	10	12	14
		Percent					
Inches	Number						
5	2	100	--	--	--	--	--
6	16	77.7	22.3	--	--	--	--
7	143	29.9	69.9	0.2	--	--	--
8	231	19.5	72.3	8.2	--	--	--
9	280	13.1	55.6	31.2	0.1	--	--
10	235	8.2	35.8	55.4	0.6	--	--
11	217	6.7	26.4	61.8	5.1	--	--
12	209	5.3	24.0	63.6	7.1	--	--
13	150	4.6	19.0	60.2	15.7	0.5	--
14	107	3.9	16.3	63.5	15.5	0.8	--
15	73	2.7	14.5	60.5	21.4	0.9	--
16	57	2.3	12.8	48.1	25.1	11.3	0.4
17	43	1.5	9.3	44.1	23.7	21.4	--
18	31	2.3	9.2	46.2	17.1	25.2	--
19	22	1.8	9.7	41.1	14.6	32.1	0.7
20	13	2.8	9.6	40.0	14.4	33.2	--
21	3	3.6	10.7	56.4	11.2	18.1	--
22	4	2.0	13.8	39.0	18.7	26.5	--
23	3	2.3	13.2	49.3	11.2	24.0	--
25	1	4.1	12.2	45.4	12.8	25.5	--
Total and average	1,840	7.0	27.5	49.8	10.5	5.2	*

* Less than 0.1 percent.

LUMBER GRADE RECOVERY

Lumber recovered ran heavy to common grades (90 percent) with only 7 percent in selects and moulding. The remaining 3 percent was graded as #1 shop and #3 clear (table 4). More selects and moulding were recovered from defective logs than from sound logs, but this still represents a small amount in board feet. About twice as much #1 and #2 common was recovered from sound logs as from defective logs. Only 5.3 percent of the lumber recovered was #5 common. The relation of lumber grade recovery to log diameter for sound, defective, and all logs for the six log grades is seen in tables 12 through 17, Appendix.

Table 4.—Average grade recovery of dried and surfaced lumber
from four sawmills

Type of logs	Lumber grades								
	Selects		Mould-		#1 shop		Common		
			ing		&				
	C & Btr.	D			#3 clear	1&2	3	4	5
----- Percent -----									
Sound	0.1	2.8	2.3	2.2	27.3	39.1	23.1	3.1	
Defective	1.1	4.0	4.6	3.4	12.4	30.3	36.2	8.0	
All	0.6	3.3	3.3	2.8	20.7	35.1	28.9	5.3	

LOG GRADES

Eighty-two percent of the logs fell in grades 3, 5, and 6 (fig. 4). The remaining 18 percent was about equally divided into the other three grades. Grade 3 contained approximately 36 percent of the logs. Subsequent analysis on the log value per M board-feet showed a value separation of logs into two groups. There was no statistically significant difference between grades 1 and 2 and between grades 3, 4, and 6. Grade 5 differed significantly from grade 3 but not from grades 4 and 6. However, both grades 1 and 2 differed significantly from grades 3, 4, 5, and 6.

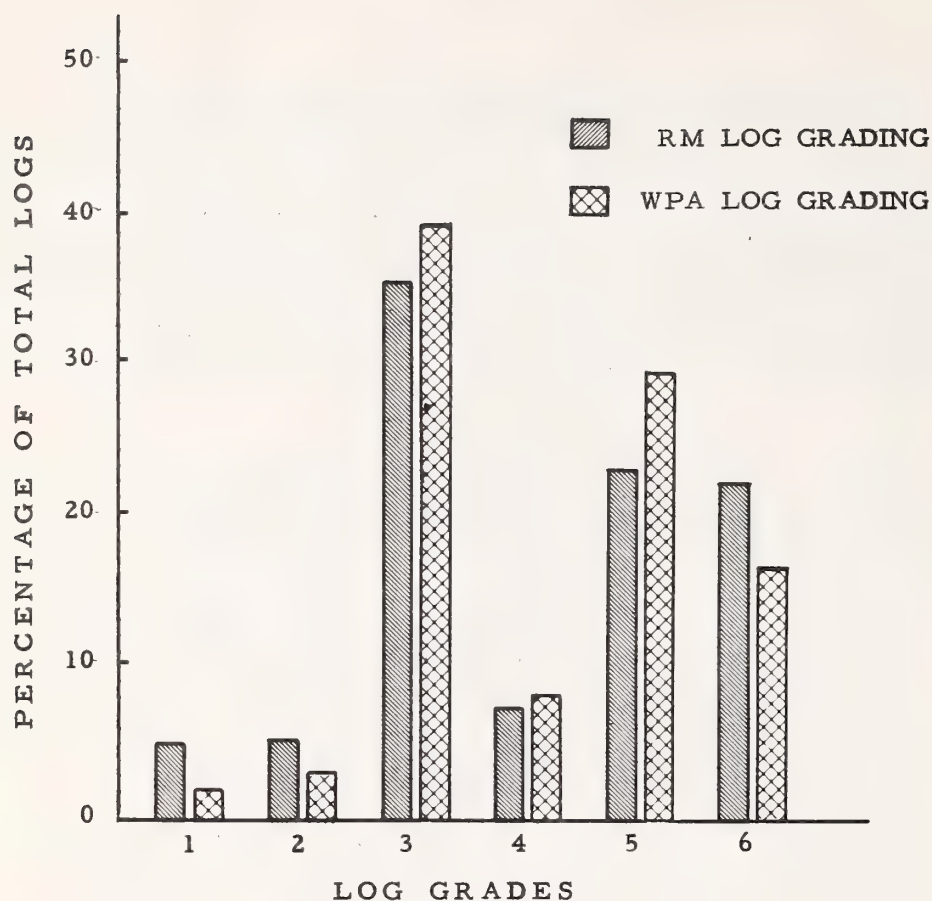


Figure 4. --Percentage of total logs placed in each U. S. Forest Service Region 6 ponderosa pine log grade by RM and WPA graders.

DISCUSSION

Log size, soundness, scaling skill, and type of sawing practice influence overrun. Sound logs produced less overrun than defective logs - - 19 percent and 43 percent, respectively (RM scaling). Greater overrun in defective logs is due to the standard scaling practices, which deduct a certain volume as unusable or as cull. However, some of this deductible material does make lumber, usually low grade, and thus increases the volume of lumber recovered. The fact that logs that are scaled as sound frequently contain hidden defect also adds to the difference in overrun. In addition, as expected with the Scribner scale, overrun was less for large sound logs than for small sound logs. Sound logs larger

than 20 inches in diameter generally produce less lumber than indicated by log scale. As shown in figure 3, a 16-foot sound log 20 inches in diameter cuts out on the average about 273 board feet of lumber. The Scribner scale for a log the same size is 280 board feet, or an underrun of 7 board feet. Similar comparison between lumber tally and Scribner log scale can be made for all logs in figure 3 and for logs cut at different mills (fig. 5). Although defective logs produce greater overrun than sound logs, the relationship of overrun and log diameter by cull classes (fig. 2) has not been established. The erratic overrun for defective logs (all cull classes combined) is shown by log grades in tables 6 through 11, Appendix. Different amounts of cull and kind of defect accounts for this variation of overrun in defective logs.

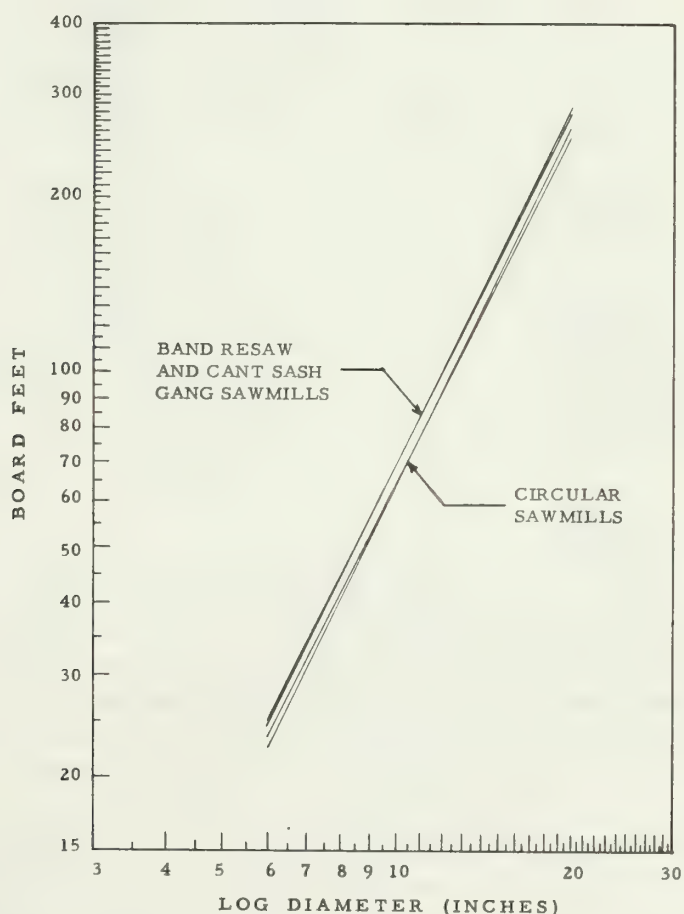


Figure 5. --Relation of lumber recovered per log to log diameter for sound 16-foot logs sawn at four sawmills (RM scaling).

The variation in overrun between sound and defective logs, log size, and sawing practices illustrate the problem of predicting actual lumber recovery for any one set of logs at any one mill. The average value of 29 percent overrun is not a weighted average for the Black Hills area. It is based on lumber produced at four mills and not on the actual proportion of lumber produced by these mill types in the entire Black Hills area. Table 5 shows the proportion of lumber sawn in this study by the four mill types is not the same as the proportion of the lumber production capacity of the different types of sawmills operating in the area.

Table 5.--Proportion of estimated current production capacity
of the different types of sawmills in the Black Hills
and the lumber sawn in this study

Mill type	Mills	Proportion of	Proportion of
		total lumber production capacity in Black Hills	total log scale sawn in study (RM scale)
	No.	Percent	Percent
Circular head rig	43	41	18
Circular head rig & circular resaw	1	3	20
Circular head rig & horizontal band resaw	2	23	47
Circular head rig and cant gangsaw	3	16	15
Band saw head rig & horizontal band resaw	1	17	0

The large overrun from defective logs will not necessarily make these logs attractive to sawmill operators. Defective logs are worth less than sound logs (table 1) because (1) they produce on the average 4 to 36 board feet less lumber per log and (2) they produce less of the better grades of common lumber.

Black Hills ponderosa pine logs cut out mostly common lumber. Only 7 percent was recovered in the select grades. Particularly interesting was the greater return of 1 and 2 grade common lumber from sound logs compared with defective logs - - 27 and 12 percent, respectively (table 4). Also, the defective logs produced 36 percent #4 common, compared with 23 percent

for sound logs. This is probably the reason why sound logs have a higher value per M board feet (table 1) even though defective logs produce a slightly higher percentage of selects (table 4). About the same relationship was found in comparing the larger and smaller sound logs. The small increase in the amount of the better lumber grades sawn from the larger logs usually did not compensate for the increase in the lower common grades. This resulted in no pronounced increase in log value per M board feet for the larger logs (tables 12 through 17, Appendix).

Recovery of lumber sawn from logs smaller than 8 inches in diameter was usually in the 4- and 6-inch widths. The saw-mills in this study cut more 8-inch boards than any other width, primarily because the market demand is greater for this width. Only a small amount (7 percent) was cut in 4-inch widths (table 3).

Loss of lumber volume and a reduction in some of the lumber grades generally takes place when the green lumber is dried and surfaced. Part of this loss is also due to the difficulty of detecting all grading defects in green, rough lumber. As seen in table 2, the greatest percentage reduction in volume within a grade was in the C and better select grade for sound logs (70.6 percent). Although this percentage is high, it represented only 258 board feet. The second greatest drop was in the C and better select grade for defective logs (41.5 percent). Here, too, actual volume loss within the grade was small - 175 board feet. The volume losses within these grades were largely made up by the volume gain in other grades. Grade 4 showed the biggest gain. The total volume loss in the kiln-dried sample from 716 logs was 2.6 percent or 1,855 board feet.

Factors that influence log value are quantity and quality of lumber in a log. Accurate prediction of log value depends upon the accuracy of predicting lumber quantity and quality. One way to do this is to use log grades that will group logs of approximately equal value per M board feet. Some log grades recognize only log surface characteristics that influence the proportion of lumber grades in the log; log diameter and amount or kind of defect are not considered in Region 6 ponderosa pine log grading. However, analysis of Region 6 log grades showed that these log surface characteristics as interpreted by the graders were only partially successful in segregating Black Hills ponderosa pine logs of approximate equal value per M board feet. Only two value groups could be separated. One group contained grade 1 and grade 2 logs and another group contained grades 3, 4, 5, and 6 logs. Except

for a difference between 3 and 5 in group 2, there was no real difference between log grades within these two groups. Further study of the application of Region 6 log grades will be continued by the U. S. Forest Service National Log Grade Committee inter-regional ponderosa pine project.

SUMMARY AND CONCLUSIONS

Lumber quantity and quality from 1,840 logs were determined at four different types of sawmills operating in the Black Hills area. Logs ranged from 5 to 25 inches d.i.b., at the small end and were from 8 to 16 feet long. The greatest number of logs were in the 9-inch diameter class. However, the average diameter was 11.1 inches. Seventy-three percent of the total log scale came from 16-foot logs.

Overrun averaged 29 percent, based on 140,888 board feet of dry, surfaced lumber and 109,140 board feet log scale. Sound logs produced less overrun than defective logs. Sound logs larger than 20 inches in diameter and defective logs larger than 22 inches produced underrun.

Recognized deductible defect was found in 42 percent of the logs. The amount of defect in the logs ranged from 4 to 100 percent, with about half of the defective logs having 30 percent or less defect. Defect lowered both total log values and values per M board feet. Most deductible defect was attributed to western red rot.

Black Hills ponderosa pine logs cut out large amounts of common lumber, most of which was in the 6- and 8-inch widths. About 21 percent of the lumber produced was 1 and 2 common, 35 percent was 3 common, and about 29 percent was 4 common. Only 7 percent of all boards were select grade and moulding. The remaining 8 percent was number 1 shop and 5 common. Approximately 77 percent of the lumber was produced in 6- to 8-inch boards. Only 7 percent was sawn into 4-inch boards.

Reduction in total lumber volume from green to dry was 2.6 percent. The greatest volume reduction was in the C and better select grades for sound logs and the next greatest reduction was in the C and better select grade for defective logs.

Ponderosa pine log grade specifications developed in U. S. Forest Service Region 6 (Oregon and Washington) were used to

classify all 1,840 logs. The specifications on which these six log grades are based segregated the 1,840 logs into two distinct value groups. Group 1 contained logs graded as 1 and 2, and group 2 contained logs graded as 3, 4, 5, and 6. With but one exception, no real difference was found between value per M board feet for the log grades within these groups.

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APPENDIX

Table 6.--Dried and surfaced lumber recovered^{1/} and overrun at four sawmills

Log grade 1, 16-foot logs

Log diameter small end	Sound logs				Defective logs				All logs			
	Logs	Average	Lumber	Over-run	Logs	Average	Lumber	Over-run	Logs	Average	Lumber	Over-run
		net	recovered			net	recovered			net	recovered	
		Scribner scale				Scribner scale				Scribner scale		
Inches	Number	Board-feet	Board-feet	Per-cent	Number	Board-feet	Board-feet	Per-cent	Number	Board-feet	Board-feet	Per-cent
9	1	40	51	27.5	1	40	39	-2.5	2	40	43	7.5
10	1	60	65	8.3	5	30	50	66.7	6	33	55	66.7
11	1	70	79	12.9	4	25	62	148.0	5	34	67	97.1
12	2	80	96	20.0	3	40	76	90.0	5	56	81	44.6
13	2	100	114	14.0	8	67	91	35.8	10	74	97	31.1
14	3	110	134	21.8	12	82	108	31.7	15	87	114	31.0
15	1	140	156	11.4	3	100	127	27.0	4	110	133	20.9
16	2	160	179	11.9	6	125	148	18.4	8	134	153	14.2
17	0	--	--	--	3	147	170	15.6	3	147	175	19.0
18	1	210	232	10.5	2	150	194	29.3	3	170	198	16.5
19	1	240	260	8.3	1	240	220	-8.3	2	240	223	-7.1
20	0	--	--	--	2	110	247	124.5	2	110	250	127.3
21	0	--	--	--	1	250	277	10.8	1	250	278	11.2
23	0	--	--	--	1	360	342	-5.0	1	360	340	-5.6

^{1/} Based on calculated values from regression curves.Table 7.--Dried and surfaced lumber recovered^{1/} and overrun at four sawmills

Log grade 2, 16-foot logs

Log diameter small end	Sound logs				Defective logs				All logs			
	Logs	Average	Lumber	Over-run	Logs	Average	Lumber	Over-run	Logs	Average	Lumber	Over-run
		net	recovered			net	recovered			net	recovered	
		Scribner scale				Scribner scale				Scribner scale		
Inches	Number	Board-feet	Board-feet	Per-cent	Number	Board-feet	Board-feet	Per-cent	Number	Board-feet	Board-feet	Per-cent
7	0	--	--	--	1	20	23	15.0	1	20	29	45.0
8	0	--	--	--	3	13	31	138.5	3	13	37	184.6
9	1	40	52	30.0	4	32	40	25.0	5	34	47	38.2
10	4	60	64	6.7	3	47	51	8.5	7	54	58	7.4
11	3	70	77	10.0	5	58	63	8.6	8	62	70	12.9
12	2	80	91	13.8	3	60	77	28.3	5	68	83	22.1
13	4	100	106	6.0	6	67	93	38.8	10	80	97	21.2
14	2	110	122	10.9	2	70	110	57.1	4	90	112	24.4
15	0	--	--	--	3	113	128	13.3	3	113	129	14.2
16	2	160	157	-1.9	6	108	148	37.0	8	121	146	20.7
17	2	180	177	-1.7	2	175	170	-2.9	4	178	165	-7.3
18	0	--	--	--	3	140	194	38.6	3	140	184	31.4
19	1	240	218	-9.2	2	120	219	82.5	3	160	205	28.1
20	0	--	--	--	2	225	247	9.8	2	225	227	0.9

^{1/} Based on calculated values from regression curves.

Table 8.--Dried and surfaced lumber recovered^{1/} and overrun at four sawmills

Log grade 3, 16-foot logs

Log diameter small end	Sound logs				Defective logs				All logs			
	Logs	Average	Lumber	Over-	Logs	Average	Lumber	Over-	Logs	Average	Lumber	Over-
		net	recov-	run		net	recov-	run		net	recov-	run
		:Scribner: :scale:	:ered:	:		:Scribner: :scale:	:ered:	:		:Scribner: :scale:	:ered:	:run
Inches	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent
6	2	20	23	15.0	--	--	--	--	2	20	21	5.0
7	8	30	32	6.7	5	20	26	30.0	13	26	29	11.5
8	16	30	42	40.0	8	19	35	84.2	24	26	39	50.0
9	27	40	53	32.5	29	28	45	60.7	56	34	50	47.1
10	34	60	67	11.7	28	42	56	33.3	62	52	62	19.2
11	33	70	81	15.7	26	56	69	23.2	59	64	75	17.2
12	28	80	98	22.5	38	54	83	53.7	66	65	90	38.5
13	22	100	115	15.0	25	80	99	23.8	47	90	106	17.8
14	13	110	135	22.7	18	66	115	74.2	31	84	124	47.6
15	18	140	156	11.4	10	100	134	34.0	28	126	143	13.5
16	11	160	178	11.2	13	127	154	21.3	24	142	164	15.5
17	12	180	202	12.2	5	142	175	23.2	17	169	186	10.1
18	3	210	228	8.6	10	171	197	15.2	13	180	209	16.1
19	4	240	255	6.2	3	177	222	25.4	7	213	234	9.9
20	3	280	284	1.4	3	213	247	16.0	6	247	261	5.7
22	0	--	--	--	1	270	304	12.6	1	270	318	17.8
25	0	--	--	--	1	440	398	-9.5	1	440	415	-5.7-

^{1/} Based on calculated values from regression curves.Table 9.--Dried and surfaced lumber recovered^{1/} and overrun at four sawmills

Log grade 4, 16-foot logs

Log diameter small end	Sound logs				Defective logs				All logs			
	Logs	Average	Lumber	Over-	Logs	Average	Lumber	Over-	Logs	Average	Lumber	Over-
		net	recov-	run		net	recov-	run		net	recov-	run
		:Scribner: :scale:	:ered:	:		:Scribner: :scale:	:ered:	:		:Scribner: :scale:	:ered:	:run
Inches	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent
6	1	20	19	-5.0	--	--	--	--	1	20	20	0
7	6	30	27	-10.0	1	20	26	30.0	7	29	27	-6.9
8	5	30	37	23.3	4	20	35	75.0	9	26	37	42.3
9	9	40	48	20.0	4	32	45	40.6	13	38	47	23.7
10	6	60	61	1.7	4	45	57	26.7	10	54	60	11.1
11	6	70	76	8.6	5	48	70	45.8	11	66	74	12.1
12	8	80	93	16.2	6	53	85	60.4	14	69	89	29.0
13	2	100	111	11.0	2	55	102	85.5	4	78	106	35.9
14	2	110	132	20.0	3	63	121	92.1	5	82	125	52.4
15	1	140	154	10.0	0	--	--	--	1	140	145	3.6
16	1	160	178	11.2	0	--	--	--	1	160	167	4.4
17	0	--	--	--	1	170	186	9.4	1	170	191	12.4
18	0	--	--	--	1	160	211	31.9	1	160	216	35.0
20	0	--	--	--	1	170	267	57.1	1	170	272	60.0

^{1/} Based on calculated values from regression curves.

Table 10.--Dried and surfaced lumber recovered^{1/} and overrun at four sawmills

Log grade 5, 16-foot logs

Log diameter small end	Sound logs				Defective logs				All logs			
	Logs	Average	Lumber	Over- run	Logs	Average	Lumber	Over- run	Logs	Average	Lumber	Over- run
		net	recov-			net	recov-			net	recov-	
		Scribner: scale	ered			Scribner: scale	ered			Scribner: scale	ered	
Inches	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent
6	2	20	25	25.0	1	10	24	140.0	3	17	25	47.1
7	22	30	33	10.0	1	20	32	60.0	23	30	33	10.0
8	27	30	44	46.7	13	15	42	180.0	40	25	43	72.0
9	34	40	55	37.5	12	28	53	89.3	46	37	54	45.9
10	23	60	68	13.3	9	42	65	54.8	32	55	67	21.8
11	21	70	82	17.1	12	52	78	50.0	33	64	80	25.0
12	15	80	98	22.5	15	53	92	73.6	30	66	95	43.9
13	9	100	114	14.0	19	63	107	69.8	28	75	111	48.0
14	7	110	133	20.9	3	97	124	27.8	10	106	128	20.8
15	5	140	152	8.6	6	113	142	25.7	11	125	146	16.8
16	3	160	173	8.1	1	140	161	15.0	4	155	166	7.1
17	3	180	195	8.3	1	0	181	--	4	135	187	38.5
18	0	--	--	--	2	170	202	18.8	2	170	208	22.4
19	0	--	--	--	2	140	224	60.0	2	140	231	65.0

^{1/} Based on calculated values from regression curves.

Table 11.--Dried and surfaced lumber recovered^{1/} and overrun at four sawmills

Log grade 6, 16-foot logs

Log diameter small end	Sound logs				Defective logs				All logs			
	Logs	Average	Lumber	Over- run	Logs	Average	Lumber	Over- run	Logs	Average	Lumber	Over- run
		net	recov-			net	recov-			net	recov-	
		Scribner: scale	ered			Scribner: scale	ered			Scribner: scale	ered	
Inches	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent	Number	Board- feet	Board- feet	Per- cent
5	1	10	17	70.0	0	--	--	--	1	10	16	60.0
6	4	20	25	25.0	0	--	--	--	4	20	24	20.0
7	24	30	34	13.3	6	20	28	40.0	30	28	32	14.3
8	21	30	45	50.0	11	23	37	60.9	32	27	43	59.3
9	21	40	57	42.5	9	22	47	113.6	30	35	54	54.3
10	24	60	71	18.3	10	44	59	34.1	34	55	67	21.8
11	13	70	86	22.9	6	43	72	67.4	19	62	81	30.6
12	9	80	102	27.5	9	61	86	41.0	18	71	97	36.6
13	11	100	120	20.0	1	40	102	155.0	12	95	114	20.0
14	8	110	140	27.3	4	88	119	35.2	12	102	133	30.4
15	4	140	161	15.0	2	10	137	1270.0	6	97	153	57.7
16	1	160	184	15.0	1	130	157	20.8	2	145	174	20.0
17	1	180	208	15.6	1	150	178	18.7	2	165	197	19.4
18	1	210	234	11.4	0	--	--	--	1	210	221	5.2
19	1	240	261	8.8	0	--	--	--	1	240	247	2.9

^{1/} Based on calculated values from regression curves.



Table 12--Percentage lumber grade recovery at four sawmills--dried and surfaced (Different green to dry lumber conversion factors used for sound, defective, and all logs)

Log grade 1, 16-foot logs

Log Diam- eter	Sound logs										Defective logs										All logs												
	Select					#1 Shop & #3 Clear	Common				Value per M b. f. $\frac{1}{100}$	Select					#1 Shop & #3 Clear	Common				Value per M b. f. $\frac{1}{100}$	Select					#1 Shop & #3 Clear	Common				Value per M b. f. $\frac{1}{100}$
	Logs	C & Btr.		D	Mould- ing		1&2	3	4	5		Logs	C & Btr.		D	Mould- ing		1&2	3	4	5		Logs	C & Btr.		D	Mould- ing		1&2	3	4	5	
		Inches	Number										Percent	Dollars										Number	Percent								
9	1	0.48	22.98	14.25	--	62.29	--	--	--	110.25	1	--	--	--	--	31.75	68.25	--	--	72.55	2	2.31	6.72	7.88	--	46.42	36.67	--	--	94.24			
10	1	--	14.13	6.77	17.45	61.65	--	--	--	88.35	5	--	5.44	4.34	2.07	18.01	22.53	30.03	17.58	69.40	6	--	7.15	4.69	5.34	26.78	18.77	24.28	12.99	74.03			
11	1	--	15.40	4.79	--	27.28	39.59	9.85	3.09	82.96	4	2.83	8.64	8.56	2.65	25.23	12.03	24.18	15.88	111.05	5	--	10.67	7.78	2.05	26.13	19.67	20.84	12.86	102.57			
12	2	--	15.93	15.40	--	43.24	18.49	6.94	--	98.71	3	--	4.93	16.61	5.73	14.31	35.56	17.66	5.20	81.42	5	--	8.97	16.44	2.50	31.70	26.15	11.62	2.62	91.56			
13	2	6.47	20.58	15.45	--	46.96	--	9.13	1.41	111.68	8	3.02	20.51	12.66	1.55	17.12	19.82	23.58	1.74	99.17	10	3.30	20.43	12.92	1.32	22.10	17.91	20.40	1.62	101.53			
14	3	--	31.86	3.32	1.69	21.30	41.83	--	--	101.89	12	4.09	12.97	11.44	3.28	16.97	25.82	20.90	4.53	92.69	15	2.35	17.03	9.64	2.95	17.59	29.17	17.68	3.59	94.54			
15	1	12.42	18.17	12.80	--	31.56	25.05	--	--	113.71	3	11.11	8.19	31.83	2.35	13.40	8.09	21.49	3.54	107.44	4	11.46	10.38	26.59	1.72	17.86	12.03	17.31	2.65	109.20			
16	2	19.76	30.59	18.32	--	9.97	21.36	--	--	129.50	6	2.60	17.09	27.42	6.87	1.92	20.68	20.43	2.99	99.49	8	7.95	20.16	24.35	4.74	4.66	20.10	15.91	2.13	109.20			
17	0	--	--	--	--	--	--	--	--	--	3	--	0.77	16.03	5.08	9.60	43.99	21.14	3.39	78.99	3	--	2.45	15.37	5.29	7.34	45.28	20.95	3.32	77.80			
18	1	12.85	16.96	29.53	5.41	--	27.80	7.45	--	116.87	2	11.92	22.97	15.28	2.37	--	15.69	29.31	2.46	113.79	3	13.23	20.42	20.34	3.26	--	19.34	21.72	1.69	115.42			
19	1	--	12.29	34.58	14.68	--	26.37	11.16	0.92	101.92	1	12.20	31.67	27.68	--	10.87	17.58	--	--	131.64	2	5.34	20.40	34.05	7.71	1.71	22.41	7.89	0.49	117.60			
20	0	--	--	--	--	--	--	--	--	--	2	--	5.43	13.22	18.74	--	9.05	50.15	3.41	72.25	2	--	6.86	12.53	18.39	--	10.20	48.71	3.31	71.18			
21	0	--	--	--	--	--	--	--	--	--	1	0.42	9.00	13.22	1.35	--	13.39	46.53	16.09	73.44	1	--	10.34	12.61	1.65	--	14.43	45.39	15.58	72.31			
23	0	--	--	--	--	--	--	--	--	--	1	--	13.25	4.13	6.34	--	51.92	21.60	2.76	81.49	1	--	14.38	3.80	6.44	--	51.47	21.22	2.69	80.25			
Total	15	3.43	21.49	16.73	3.80	20.26	25.82	7.82	0.65	108.79	52	3.40	12.83	15.68	4.47	9.95	24.25	24.52	4.90	93.44	67	3.34	14.95	15.93	4.32	12.33	24.72	20.53	3.88	97.08			

¹/M b. f. = 1,000 board feet lumber tally.

Table 13--Percentage lumber grade recovery at four sawmills--dried and surfaced (Different green to dry lumber conversion factors used for sound, defective, and all logs)

Log grade 2, 16-foot logs

Log Diam- eter	Sound logs										Defective logs										All logs									
	Select					Common					Select					Common					Select					Common				
	Logs	C & Btr.	D	Mould- ing	#1 Shop & #3 Clear	1&2	3	4	5	Value per M b. f. 1/	Logs	C & Btr.	D	Mould- ing	#1 Shop & #3 Clear	1&2	3	4	5	Value per M b. f. 1/	Logs	C & Btr.	D	Mould- ing	#1 Shop & #3 Clear	1&2	3	4	5	Value per M b. f. 1/
Inches	Number	Percent								Dollars	Number	Percent								Dollars	Number	Percent								Dollars
7	0	--	--	--	--	--	--	--	--	--	1	--	--	--	--	10.59	60.64	--	28.77	44.71	1	--	--	--	--	9.59	61.92	--	28.49	48.15
8	0	--	--	--	--	--	--	--	--	--	3	--	--	20.30	--	5.95	28.94	24.95	19.86	53.86	3	--	--	20.12	--	5.10	31.08	23.75	19.95	57.95
9	1	--	--	--	--	23.77	76.23	--	--	80.51	4	--	4.48	10.80	--	45.29	18.21	21.22	--	72.05	5	--	3.47	9.03	--	40.30	31.66	15.54	--	74.24
10	4	--	2.97	--	--	40.51	47.66	5.93	2.93	87.44	3	0.21	--	5.84	--	47.52	43.13	3.30	--	66.30	7	--	--	4.34	--	45.11	42.08	6.97	1.50	68.79
11	3	--	3.94	--	--	26.51	36.46	24.43	8.66	77.46	5	--	0.33	10.03	2.80	23.58	26.89	31.60	4.77	62.99	8	--	0.79	7.70	1.71	25.20	28.97	29.62	6.01	64.92
12	2	--	12.09	12.67	--	34.09	37.87	--	3.28	103.20	3	9.82	0.27	15.78	3.53	29.95	30.86	8.58	1.21	78.52	5	5.50	4.53	14.96	0.54	33.95	33.26	5.25	2.01	82.39
13	4	2.45	15.41	10.70	--	26.43	35.41	6.56	3.04	105.51	6	--	3.37	9.76	1.87	6.50	43.06	32.04	3.40	60.35	10	0.31	7.80	10.46	--	16.62	39.23	22.42	3.16	71.72
14	2	2.83	18.69	--	--	40.51	37.97	--	--	110.24	2	4.27	4.96	24.69	--	12.21	37.20	10.73	5.94	75.99	4	2.72	11.02	13.09	--	29.86	35.01	5.33	2.97	83.43
15	0	--	--	--	--	--	--	--	--	--	3	--	3.06	7.89	7.32	0.77	30.62	46.78	3.56	55.20	3	--	4.32	7.88	4.93	--	33.15	45.92	3.80	59.45
16	2	12.53	25.31	8.42	--	29.03	24.71	--	--	131.57	6	3.19	10.75	17.03	10.91	8.32	32.84	13.56	3.40	73.78	8	5.59	14.55	15.06	6.95	13.92	31.12	9.99	2.82	84.69
17	2	--	7.98	7.62	22.70	12.29	37.92	11.49	--	84.77	2	6.06	8.43	10.14	--	23.04	52.33	--	--	78.32	4	2.52	6.30	8.64	14.97	18.42	41.28	7.87	--	74.55
18	0	--	--	--	--	--	--	--	--	--	3	1.44	--	8.66	5.04	1.27	41.51	33.56	8.52	56.07	3	2.03	0.08	8.71	2.64	0.44	44.40	32.86	8.84	60.39
19	1	10.08	20.50	6.30	--	39.57	20.08	3.47	--	134.83	2	5.20	22.74	21.61	10.00	--	16.59	18.52	5.34	84.12	3	6.68	21.31	16.11	6.65	15.21	16.56	13.81	3.67	95.34
20	0	--	--	--	--	--	--	--	--	--	2	0.47	23.25	22.07	3.33	16.14	10.88	22.35	1.51	89.31	2	1.04	24.51	22.02	0.87	15.29	13.29	21.25	1.73	96.18
Total	21	3.78	13.56	7.37	0	30.44	36.67	5.62	2.56	103.38	45	2.04	7.79	14.38	4.91	13.32	31.69	21.96	3.91	70.84	66	2.36	9.15	12.19	3.49	19.46	32.62	17.32	3.41	77.33

1/ M b. f. = 1,000 board feet lumber tally.

Table 14.--Percentage lumber grade recovery at four sawmills--dried and surfaced (Different green to dry lumber conversion factors used for sound, defective, and all logs)

Log grade 3, 16-foot logs

Log Diam- eter	Sound logs										Defective logs										All logs									
	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/
	Logs	C & Btr.			1&2	3	4	5	C & Btr.		D	1&2			3	4	5	C & Btr.	D		1&2	3			4	5				
Inches	Number				Percent				Dollars	Number					Percent				Dollars	Number					Percent				Dollars	
6	2	--	---	---	--	69.01	30.99	--	--	86.68	0	--	--	--	--	---	---	--	--	2	---	--	--	--	71.17	28.83	--	--	87.45	
7	8	--	1.38	---	--	53.61	25.87	16.77	2.37	82.99	5	--	--	--	--	38.80	36.53	20.64	4.03	73.96	13	--	1.02	--	--	48.40	29.63	17.98	2.97	79.67
8	16	--	---	---	--	39.58	25.84	28.79	5.79	73.66	8	--	--	--	--	22.60	34.10	28.69	14.61	63.89	24	---	---	--	--	35.80	27.67	28.22	8.31	71.14
9	27	--	1.28	0.92	--	43.85	29.43	21.28	3.24	79.56	29	--	1.48	0.51	--	29.34	29.71	31.37	7.59	71.36	56	--	1.38	0.73	--	36.78	29.66	26.19	5.26	75.85
10	34	--	1.58	2.22	--	35.78	37.90	19.95	2.57	79.02	28	--	2.16	0.17	1.32	20.98	36.85	32.79	5.73	70.94	62	--	1.87	1.34	0.08	30.10	37.41	25.31	3.89	75.83
11	33	0.27	0.07	1.51	--	28.35	41.72	23.23	4.85	73.94	26	--	2.89	1.23	2.20	18.05	32.42	38.74	4.47	70.02	59	0.04	1.26	1.35	0.80	24.64	37.87	29.38	4.66	72.43
12	28	0.10	1.57	1.87	0.46	28.11	45.48	21.80	0.61	76.87	38	--	3.68	1.40	1.33	21.80	32.85	32.97	5.97	72.49	66	0.01	2.65	1.65	0.84	24.43	38.96	28.01	3.45	74.47
13	22	0.08	1.55	2.55	1.60	30.34	44.42	19.13	0.33	78.94	25	0.48	4.84	2.47	2.74	18.05	38.86	25.08	7.48	74.73	47	0.27	3.16	2.52	2.13	24.19	41.74	22.16	3.83	76.85
14	13	0.45	7.27	4.88	2.52	34.53	31.97	17.88	0.50	87.19	18	0.93	3.36	4.88	8.32	5.40	32.44	37.29	7.38	70.38	31	0.73	5.08	4.92	5.60	18.16	32.45	28.80	4.26	78.08
15	18	0.78	3.73	3.35	10.69	10.82	41.05	26.18	3.40	73.90	10	1.86	7.44	2.78	6.54	8.49	33.29	35.99	3.61	76.60	28	1.07	5.02	3.08	9.55	11.06	38.03	28.78	3.41	75.00
16	11	--	3.83	4.68	5.70	5.91	37.42	35.70	6.76	71.20	13	1.09	7.18	4.23	9.29	2.27	32.29	35.70	7.95	72.73	24	0.49	5.55	4.47	7.52	3.67	34.98	35.94	7.38	71.90
17	12	2.03	7.72	4.79	7.53	19.14	33.45	22.49	2.85	87.26	5	--	1.97	4.03	13.82	--	19.05	44.44	16.69	59.50	17	1.35	6.50	4.50	9.41	15.45	29.26	27.30	6.23	81.06
18	3	2.30	1.97	7.57	10.59	5.78	41.17	29.91	0.71	80.32	10	3.69	6.78	5.72	7.46	9.31	30.81	31.85	4.38	83.04	13	3.42	5.40	6.34	7.88	6.70	34.29	32.43	3.54	81.82
19	4	--	0.64	5.28	7.23	5.92	38.39	40.22	2.32	66.77	3	0.99	6.17	2.93	8.48	13.01	27.65	33.65	7.12	75.83	7	0.26	2.99	4.71	8.39	1.71	36.91	40.61	4.42	70.50
20	3	0.40	3.33	5.27	12.04	1.42	37.28	26.81	13.45	70.17	3	--	3.12	--	21.18	22.37	24.00	24.17	5.16	73.91	6	---	3.23	2.25	16.68	11.84	30.87	25.78	9.35	71.96
22	0	--	--	--	--	--	--	--	--	--	1	3.59	5.31	11.81	4.51	--	34.58	31.97	8.23	78.66	1	3.61	4.78	11.75	3.75	--	35.19	32.84	8.08	77.69
25	0	--	--	--	--	--	--	--	--	--	1	--	--	8.04	1.17	--	--	45.99	44.80	48.32	1	--	--	8.20	0.55	--	--	47.07	44.18	47.74
Total	234	0.40	2.80	3.13	3.69	23.67	38.83	24.35	3.13	77.53	223	0.67	4.24	2.77	5.33	14.15	31.97	33.50	7.37	72.71	457	0.52	3.47	2.96	4.45	19.23	35.58	28.68	5.11	75.29

1/ M b. f. = 1,000 board feet lumber tally.

Table 15.--Percentage lumber grade recovery at four sawmills—dried and surfaced (Different green to dry lumber conversion factors used for sound, defective, and all logs)

Log grade 4, 16-foot logs

Log Diam- eter	Sound logs										Defective logs										All logs									
	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/
	Logs	C & Btr.			D	1&2	3	4	5		C & Btr.	D			1&2	3	4	5	C & Btr.		D	1&2			3	4	5			
Inches	Number	Percent								Dollars	Number	Percent								Dollars	Number	Percent								Dollars
6	1	--	--	--	--	--	21.75	78.25	--	46.74	0	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	20.37	79.63	--	47.11
7	6	--	--	--	--	61.69	22.30	16.01	--	83.55	1	--	--	--	--	--	26.45	43.80	29.75	43.50	7	--	--	--	--	57.80	21.64	18.65	1.91	80.84
8	5	--	--	--	--	66.44	16.91	16.65	--	85.13	4	--	--	--	--	42.59	26.04	31.37	--	76.26	9	--	--	--	--	56.35	21.60	22.05	--	81.79
9	9	--	--	1.05	--	28.53	36.38	32.76	1.28	71.33	4	--	--	--	--	28.82	7.42	53.74	10.02	65.00	13	--	--	0.54	--	29.85	28.09	37.94	3.58	70.02
10	6	--	3.94	--	--	20.47	33.53	33.72	8.34	70.20	4	--	--	--	--	7.66	47.95	44.39	--	65.43	10	--	2.28	--	--	15.42	40.59	37.80	3.91	68.30
11	6	--	2.35	--	1.71	46.59	31.62	17.73	--	81.36	5	--	--	4.48	--	5.60	20.75	60.42	8.75	58.38	11	--	1.25	1.77	0.56	27.46	28.32	37.16	3.48	71.19
12	8	--	--	--	0.93	21.60	35.89	34.56	7.02	67.00	6	0.19	2.47	--	--	14.52	40.08	31.43	11.31	68.92	14	--	0.70	--	0.23	19.73	38.23	32.76	8.35	67.84
13	2	--	--	--	--	13.08	50.67	34.85	1.40	67.32	2	--	--	--	--	2.38	58.08	39.54	--	65.09	4	--	--	--	--	7.79	55.59	36.62	--	66.08
14	2	--	2.34	2.42	1.48	11.94	49.04	32.78	--	72.40	3	--	--	--	1.62	12.93	49.32	35.20	0.93	67.78	5	--	0.94	0.76	1.57	11.57	51.38	33.58	0.20	69.47
15	1	--	--	--	5.07	--	61.83	23.85	9.25	57.97	0	--	--	--	--	--	--	--	--	--	1	--	--	--	4.85	--	61.73	24.32	9.10	59.12
16	1	--	--	--	4.54	25.93	51.43	18.10	--	73.11	0	--	--	--	--	--	--	--	--	--	1	--	--	--	4.07	29.87	48.50	17.56	--	74.59
17	0	--	--	--	--	--	--	--	--	--	1	--	--	1.88	10.67	--	31.88	55.57	--	62.72	1	--	--	1.79	10.28	--	35.71	52.22	--	61.00
18	0	--	--	--	--	--	--	--	--	--	1	--	2.31	--	7.44	--	24.14	45.42	20.69	55.66	1	--	1.80	--	7.26	--	28.52	42.66	19.76	54.19
20	0	--	--	--	--	--	--	--	--	--	1	--	--	--	4.60	--	17.19	48.73	29.28	53.37	1	--	--	--	4.79	--	21.96	45.59	27.66	48.36
Total	47	0	0.41	0.01	1.15	28.28	38.26	28.94	2.95	72.28	32	0	0.54	0.45	1.73	9.14	34.25	45.83	8.06	63.26	79	0	0.51	0.19	1.38	20.15	35.88	36.63	5.26	68.28

1/ M b. f. = 1,000 board feet lumber tally.

Table 16.--Percentage lumber grade recovery at four sawmills--dried and surfaced (Different green to dry lumber conversion factors used for sound, defective, and all logs)

Log grade 5, 16-foot logs

Log Diam- eter	Sound logs										Defective logs										All logs										
	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	
	Logs	C & Btr.			D	1&2	3	4	5		Logs	C & Btr.			D	1&2	3	4	5		Logs	C & Btr.			D	1&2	3	4	5		
Inches	Number				Percent					Dollars	Number				Percent					Dollars	Number				Percent					Dollars	
6	2	--	--	--	--	32.41	19.31	48.28	--	69.38	1	--	--	--	--	100.00	--	--	--	--	106.17	3	--	--	--	--	54.37	13.51	32.12	--	81.16
7	22	--	0.18	0.84	--	42.98	32.73	20.13	3.14	77.03	1	--	--	--	--	8.16	20.90	56.35	14.59	54.76	23	--	0.17	0.66	--	42.49	33.99	20.88	1.81	77.58	
8	27	--	0.59	1.22	0.26	44.03	30.26	20.10	3.54	77.75	13	--	--	--	--	12.69	35.36	35.28	16.67	130.31	40	--	0.38	0.75	0.07	34.51	32.43	24.71	7.15	72.46	
9	34	--	--	--	--	32.25	35.24	25.73	6.78	71.39	12	--	--	--	--	21.30	31.24	38.89	8.57	66.06	46	--	--	--	--	29.97	34.91	28.73	6.39	70.70	
10	23	--	0.20	--	0.03	36.34	36.00	25.81	1.62	75.17	9	--	--	1.26	--	18.71	22.48	44.65	12.90	63.72	32	--	0.13	0.42	--	32.34	33.18	30.24	3.69	73.00	
11	21	0.15	0.29	0.43	0.13	34.63	36.43	24.55	3.39	74.77	12	--	0.39	--	--	11.52	31.40	46.00	10.69	62.68	33	0.15	0.34	0.20	0.06	26.87	35.06	31.78	5.54	70.99	
12	15	--	0.69	0.56	0.84	19.65	46.81	26.68	4.77	70.34	15	--	0.60	0.26	1.04	19.44	26.67	40.00	11.99	65.69	30	--	0.65	0.43	0.94	19.30	36.64	33.37	8.67	67.76	
13	9	--	0.23	--	0.16	21.20	36.55	31.63	10.23	67.31	19	--	0.36	1.48	1.92	13.04	35.23	36.49	11.48	65.00	28	--	0.32	1.11	1.30	15.05	34.46	35.49	12.27	64.79	
14	7	--	--	--	0.61	14.77	41.90	38.38	4.34	67.35	3	0.84	2.13	--	3.92	7.13	26.45	47.05	12.48	62.90	10	0.21	0.54	--	1.55	13.15	38.31	40.40	5.84	66.69	
15	5	--	--	--	6.81	10.05	47.21	29.96	5.97	66.21	6	--	1.56	1.63	3.90	9.90	31.78	46.05	5.18	68.10	11	--	0.80	1.00	5.25	9.57	38.35	38.88	6.15	66.64	
16	3	--	--	--	6.91	4.76	50.35	36.34	1.64	67.23	1	--	--	--	--	--	68.02	31.98	--	73.99	4	--	--	--	5.22	4.73	55.14	34.91	--	69.48	
17	3	1.05	--	--	6.09	20.27	25.45	39.36	7.78	72.77	1	--	--	--	2.77	--	27.75	62.23	7.25	59.24	4	0.85	--	--	5.24	16.12	26.77	44.29	6.73	70.12	
18	0	--	--	--	--	--	--	--	--	--	2	--	--	--	0.64	2.78	5.92	89.33	1.33	58.85	2	--	--	--	0.61	0.72	2.93	91.34	4.40	56.64	
19	0	--	--	--	--	--	--	--	--	--	2	--	--	--	7.46	--	4.23	75.98	12.33	54.48	2	--	--	--	7.30	--	1.17	76.34	15.19	52.42	
Total	171	0	0.20	0.42	1.06	28.24	37.81	27.56	4.71	72.09	97	0.15	0.44	0.57	1.61	12.86	28.68	45.45	10.24	66.18	268	0.06	0.31	0.47	1.29	21.99	34.14	34.83	6.91	68.83	

1/M b. f. = 1,000 board feet lumber tally.

Table 17.--Percentage lumber grade recovery at four sawmills--dried and surfaced (Different green to dry lumber conversion factors used for sound, defective, and all logs)

Log grade 6, 16-foot logs

Log Diam- eter	Sound logs										Defective logs										All logs									
	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/	Select		Mould- ing	#1 Shop & #3 Clear	Common					Value per M b. f. 1/
	Logs	C & Btr.			D	1&2	3	4	5		Logs	C & Btr.			D	1&2	3	4	5		Logs	C & Btr.			D	1&2	3	4	5	
Inches	Number					Percent				Dollars	Number					Percent				Dollars	Number					Percent				Dollars
5	1	--	--	--	--	77.71	22.29	--	--	88.07	0	--	--	--	--	--	--	--	--	--	1	--	--	--	--	75.19	24.81	--	--	89.76
6	4	--	--	--	--	35.43	36.90	25.57	2.10	74.15	0	--	--	--	--	--	--	--	--	--	4	--	--	--	--	36.68	40.60	22.16	0.56	75.68
7	24	0.41	--	--	--	31.40	37.87	29.51	0.81	73.14	6	--	--	--	--	25.58	22.12	46.30	6.00	65.70	30	--	--	--	--	30.97	37.34	30.73	0.96	72.60
8	21	--	0.98	--	--	34.05	34.62	29.31	1.04	74.55	11	--	--	--	--	17.72	43.32	35.43	3.53	66.18	32	--	0.67	--	--	29.57	37.47	30.69	1.60	72.30
9	21	--	--	--	--	40.55	33.66	23.94	1.85	76.74	9	--	--	--	--	9.72	22.76	43.03	24.49	56.26	30	--	--	--	0.04	32.18	30.93	28.82	8.03	71.27
10	24	0.16	0.65	0.47	0.35	22.56	44.48	29.03	2.30	72.42	10	--	--	--	1.88	14.00	33.80	43.30	7.02	65.17	34	--	0.43	0.49	0.83	20.29	42.02	32.49	3.45	70.57
11	13	--	--	--	0.34	28.44	38.77	29.04	3.41	72.49	6	--	0.48	--	1.90	5.59	35.26	41.90	14.87	59.40	19	--	0.27	--	0.83	22.33	38.35	31.88	6.34	69.20
12	9	--	--	--	--	25.07	45.09	25.47	4.37	72.04	9	--	--	--	2.38	1.87	36.13	59.62	--	62.51	18	--	--	--	0.43	13.98	39.58	43.28	2.73	66.98
13	11	--	--	0.70	2.55	23.67	42.53	28.24	2.31	72.26	1	--	--	--	--	--	--	10.29	89.71	32.03	12	--	--	0.84	3.00	23.44	43.49	24.27	4.96	71.75
14	8	--	--	0.26	0.05	30.97	43.30	23.90	1.52	74.92	4	--	--	1.94	4.87	2.36	25.38	54.68	10.77	59.68	12	--	--	0.77	1.50	22.51	38.25	32.80	4.17	70.61
15	4	--	--	--	1.28	21.42	61.43	14.96	0.91	74.04	2	--	--	--	--	--	25.90	46.87	27.23	53.52	6	--	--	--	1.25	14.72	49.66	25.04	9.33	67.51
16	1	--	--	--	3.73	53.29	27.07	15.91	--	94.91	1	--	--	--	--	12.42	37.51	49.49	0.58	67.49	2	--	--	--	2.16	32.50	30.10	34.08	1.16	80.76
17	1	--	--	--	25.88	20.49	27.76	12.48	13.39	69.95	1	--	--	--	8.77	4.17	45.13	41.93	--	67.79	2	--	--	--	17.32	12.07	36.04	29.27	5.30	67.91
18	1	--	--	--	10.52	32.74	56.74	--	--	78.37	0	--	--	--	--	--	--	--	--	--	1	--	--	--	9.65	29.19	52.12	9.04	--	80.06
19	1	--	--	--	19.17	--	11.23	63.25	6.35	57.82	0	--	--	--	--	--	--	--	--	--	1	--	--	--	20.14	--	14.83	60.10	4.93	59.07
Total	144	0	0.34	0.13	1.47	28.28	40.62	26.77	2.39	73.66	60	0	0	0.66	2.45	8.06	32.15	46.53	10.15	61.40	204	0	0.23	0.30	1.79	22.86	38.73	31.76	4.33	70.49

1/ M b. f. = 1,000 board feet lumber tally.

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